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# A new conception of the chaetotaxy on epicranium of the lepidopterous larva

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**Abstract** The number of setae on the epicranium of lepidopterous larva is the same as that on the thorax or abdomen. In consequence, an attempt was made to apply one and the same system to the chaetotaxy of the epicranium and the thoracic or abdominal segment. This new system is similar to Dyar's system. The homology of setae between the epicranium and the thoracic or abdominal segment was discussed. In addition, it is noted that, if the labral piece were combined with the fronto-clypeal piece, then number of tactile setae on both pieces would be nearly same to that of setae on the thorax or abdomen.

**Key words** Lepidopterous larva, epicranium, chaetotaxy.

Dyar (1896) paid attention to the setae on the cranium of lepidopterous larva for the first time and Dampf (1910) proposed setal location on the head to be a natural group, although he did not give a name to individual seta. Since then, the cranium chaetotaxy has been treated under a system different from that for the thorax or abdomen. Dampf's section (Fig. 2, B), however, may not necessarily be reliable. One owes much to Heinrich (1916) for the present chaetotaxy. He gave a name to a large number of setae on the head and determined their positions. Gerasimov (1935) perfected the cranium chaetotaxy and Hinton (1946) revised Gerasimov's work in respect to some sensory pores and micro-proprioceptors.

The above-cited investigators dealt with the chaetotaxy of the cranium as a whole. If they had limited the object of their studies to the epicranium, they would have obtained different results. The number of setae (including micro-proprioceptor) on the epicranium is 16 or rarely 17 (in the half piece). It is very interesting that this number is entirely identical with the number of setae on the thorax or abdomen (particularly prothorax). Therefore, there is possibility of applying the chaetotaxy of the thorax or abdomen to the epicranium. Conversion of some of the thorax and abdomen into the primitive head of arthropods in their revolutionary history must support this possibility.

If so, what would be the location on the epicranium of the setae which are homologus with those on the thorax or abdomen? The thoracic and abdominal setae disperse into six horizontal "area"s (Mutuura, 1956) and the many lines or stripes run along the "area"s in some species. These lines or stripes frequently continue to the epicranium, and such a pattern on the head should play the role of an indicator of the location of setae. The main stripes on the epicranium are submedian, lateral and postlateral and they extend somewhat obliquely from the upper posterior to the lower anterior on the head hemisphere, but never to the frons. Terefore, the same "area" as on the thorax and abdomen is present on the epicranium and the presumable "area" may be situated on the epicranium as shown in Fig. 2, C and D. Then homologus setae are located in these "area"s as on the thorax and abdomen. A similar relationship between the stripes and the setae has been reported for the anal proleg (Nakamura, 1992). However, the position of the gena seta suggests that only the sternal "area" may have been turned from anterior to posterior.

The tactile setae on the thorax or abdomen are situated as follows: $D_1$ and $D_2$ in dorsal

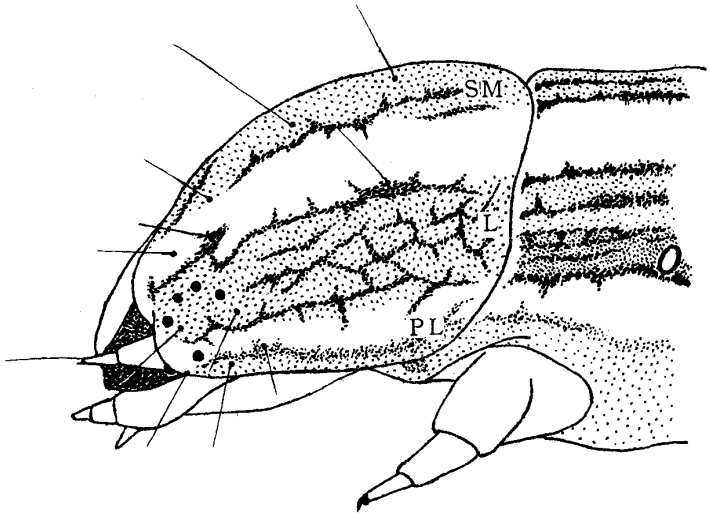


Fig. 1. The pattern of stripes on the head and prothorax of *Aletia nigrilinea* (Leech). Lateral view (L: lateral stripe: PL: postlateral stripe: SM: submedian stripe).

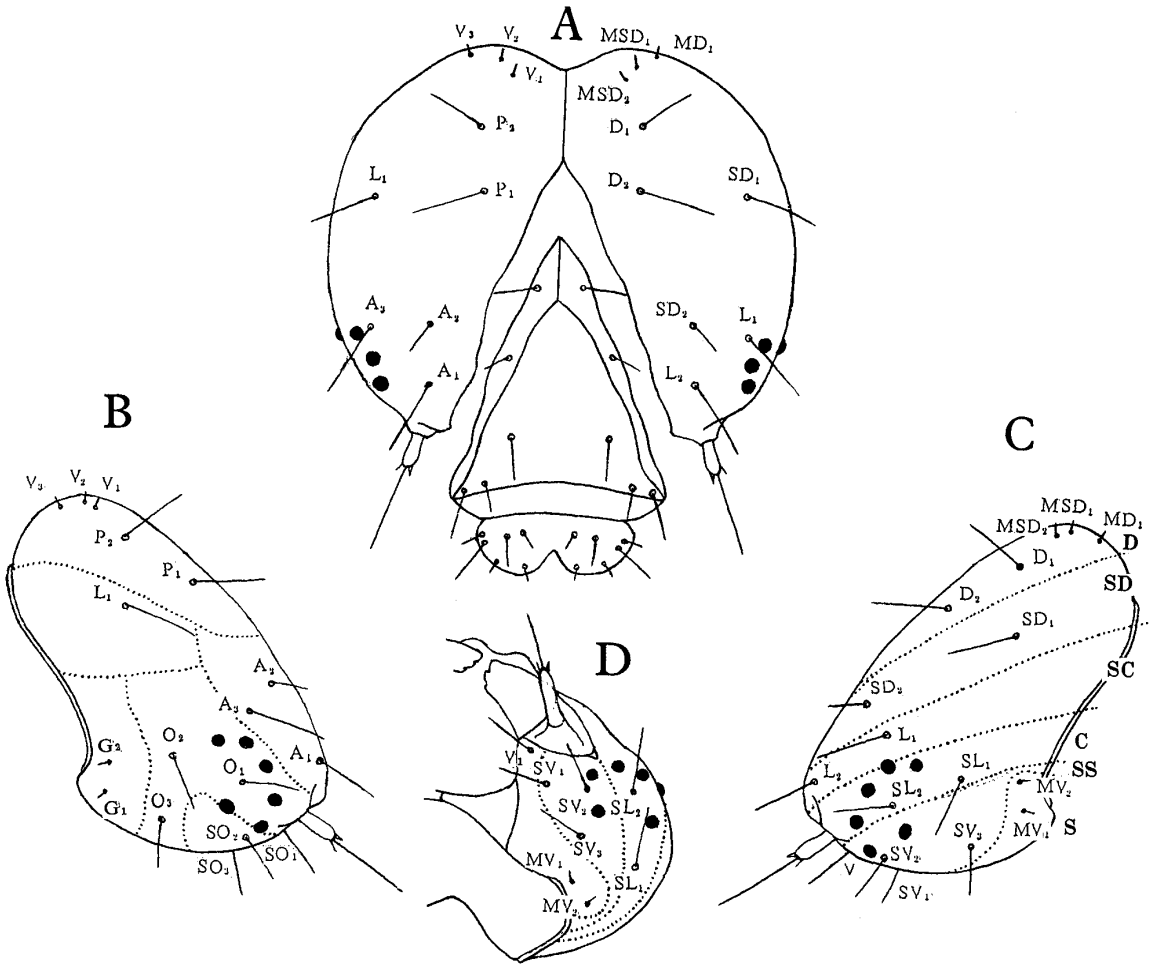


Fig. 2. Model of the chaetotaxy on epicranium of lepidopterous larva. (A) Frontal view: left half showing the epicranium chaetotaxy and right half showing the thorax or abdomen chaetotaxy. (B) and (C) Lateral views: (B) showing the epicranium chaetotaxy (dotted line showing Dampf's section, after Gerasimov, 1935) and (C) showing the thorax or abdomen chaetotaxy as applied to the epicranium setae (dotted line showing presumable thorax or abdomen "area" proposed by the author). (D: dorsal area, SD: subdorsal area, SC: subcoxal area, C: coxal area, SS: substernal area, S: sternal area) (D) Postero-lateral view: showing the thorax or abdomen chaetotaxy as applied to the epicranium setae.

area, $SD_1$ and $SD_2$ in subdorsal area, $L_1$ and $L_2$ in subcoxal area, $SL_1$ and $SL_2$ in coxal area, $SV_1$, $SV_2$ and $SV_3$ in substernal area and $V_1$ in sternal area, and the micro-proprioceptor $MD_1$ is in dorsal area, $MSD_1$ and $MSD_2$ in subdorsal area and $MV_1$ and $MV_2$ in sternal area.

It is accordingly certain that the setae $V_1$, $V_2$ and $V_3$ on the epicranium are homologous with $MD_1$, $MSD_1$ and $MSD_2$ on the thorax or abdomen, $P_1$ with $D_2$, $P_2$ with $D_1$, $L_1$ with $SD_1$, $A_2$ with $SD_2$ (in general, $A_2$ on epicranium is short and $SD_2$ on abdomen is a micro seta), $A_3$ with $L_1$, $A_1$ with $L_2$, $O_1$ with $SL_2$, $O_2$ with $SL_1$, $O_3$ with $SV_3$, $SO_2$ with $SV_2$, $SO_3$ with $SV_1$, $SO_1$ with $V_1$, $G_1$ with $MV_1$ and $G_2$ with $MV_2$ as shown in Fig. 2 and Table 1. However $G_2$ is a seta which appears only in the larvae of primitive species such as *Hepialidae*. New grouping of the epicranium setae proposed in this paper seems to be similar to Dyar's system rather than to Dampf's thought, and be more natural.

The location and the nomenclature of sensory pores have been discussed in the cranium chaetotaxy studies until now, but no reference has been made to them in this paper by reason of the absence of sensory pore on the thorax and abdomen.

The results indicate that this system differs only slightly from Hinton's system as follows: (1) A-seta is divided in two and one half is combined with L-seta, (2) O-setae are separated and one of them is united with SO-seta and (3) one of SO-setae is separated and included in the special group. These modifications seem to rather resemble Dyar's system.

At the present time, it is difficult to offer a plausible explanation to the fact that the chaetotaxy of only epicranium is the same as that of the thorax or abdomen.

An extremely curious phenomenon concerns the chaetotaxy of the parts remaining after removal of the epicranium from the cranium. The fronto-clypeal piece possesses 5

Table 1. Relationship of homology between thoracic or abdominal segment and epicranium chaetotaxy (after Hinton's (1946) nomenclature).

| Area | Thorax or abdomen setae | Epicranium setae |
|---|---|---|
| Dorsal | $D_1$ | $P_2$ |
| | $D_2$ | $P_1$ |
| Subdorsal | $SD_1$ | $L_1$ |
| | $SD_2$ | $A_2$ |
| Subcoxal | $L_1$ | $A_3$ |
| | $L_2$ | $A_1$ |
| Coxal | $SL_1$* | $O_2$ |
| | $SL_2$* | $O_1$ |
| Substernal | $SV_1$ | $SO_3$ |
| | $SV_2$ | $SO_2$ |
| | $SV_3$ | $O_3$ |
| Sternal | $V_1$ | $SO_1$ |
| Proprioceptor (Dorsal) | $MD_1$ | $V_1$ |
| | $MSD_1$ | $V_2$ |
| | $MSD_2$ | $V_3$ |
| (Sternal) | $MV_1$ | $G_1$ |
| | $MV_2$ | $G_2$ |

* See Nakamura (1992).

tactile setae. The labrum is articulated with this piece and 6 setae appear on it. If the setae on both pieces are added together, they reach 11 in number. The fronto-clypeal and labral pieces do not need proprioceptor and these micro-setae may probably have vanished. Thus, the number of setae becomes identical with that of tactile seta on the thorax or abdomen. It is, however, not possible to find an immediate solution to this problem of setal homology.

## Literature cited

Dampf, A., 1910. Zur Kenntnis gehausetragender Lepidopterenlarven. *Zool. Jb.* (Suppl.) **12**: 513-608.
Dyar, H.G., 1896. Note on the head setae of lepidopteous larvae. *Ann. N. Y. Acad. Sci.* **8**: 194-232.
Gerasimov, A.M., 1935. Zur Frage der Homodinamie der Borsten von Schmetterlingsraupen. *Zool. Anzeig.* **112** (7/8): 177-194.
Heinrich, C., 1916. On the taxonomic value of some larval characters in the Lepidoptera. *Proc. ent. Soc. Wash.* **18**: 154-164.
Hinton, H. E., 1946. On the homology and nomenclature of the setae of lepidopterous larvae, with some notes on the phylogeny of the Lepidoptera. *Trans. R. ent. Soc. Lond.* **97**: 1-37.
Mutuura, A., 1956. On the homology of the body areas in the thorax and abdomen and new system of the seta on the lepidopterous larvae. *Bull. Univ. Osaka Pref.* **6**: 93-122.
Nakamura, M., 1992. A proposal for setal homology and nomenclature on the anal pod of the lepidopterous larva. *Tyô Ga* **43**: 53-61 (in Japanese).

## 摘　　要

鱗翅類幼虫の頭蓋板上の刺毛式に対する新しい考え方 (中村正直)

鱗翅類幼虫の頭部の刺毛式はこれまで多くの研究者によって調べられてきたが，Dampf (1910) の研究以後胸・腹部の刺毛式とは全く別の方式の許に取り扱われている．またこれら研究者は何れも頭蓋全体の刺毛を対象としている．しかしこれを頭蓋板に限定して考えると，そこに生じている刺毛は自己感応的微刺毛を含め 16 本 (コウモリガ科など原始的なものでは 17 本) と胸・腹部の刺毛と全く同数である．

その上各刺毛群も Dampf の考え方 (第 2 図，B) によらず，胸・腹部にある 6 個の体域に相当する部分が頭部にまで延長したと想定すれば第 2 図，C の如くになるので，その間に分布する刺毛は完全に胸・腹部の刺毛式と同一に取り扱えることが判明した．これまで何故この様な見方がなされなかったのか不思議でさえある．両者の刺毛の比較を第 1 表に掲げた．結果的にみると，この刺毛式は Dyar (1896) の考え方に近いものとなる．

ただし何故頭蓋板上の刺毛のみが胸・腹部の刺毛と相同するのか，また前頭＋上唇片に生ずる刺毛の数が胸・腹部のそれ (微刺毛を除く) と一致するのかといった点については直ちに適切な判断を行うことは困難である．

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